

AMENDMENTS TO CLAIMS

Please amend claims 3-6, 8, 12-15, 21, 60, 62, 64 and 66. Claims 1, 2, 16, 17, 22-31, 33-36, 38, 40, 43, 61, 63, 65, and 67 were previously canceled, claims 41, 42, 46, 50, 54, and 58 were previously withdrawn. All pending claims are reproduced below, including those that remain unchanged.

1. (Canceled)
2. (Canceled)
3. (Currently amended) A method for shaping optical elements, comprising:
 - creating an annular plasma;
 - injecting a separate flow of a precursor into the annulus center of the annular plasma;
 - exciting the precursor with a radio frequency (RF) power via the annular plasma to create at least one reactive species; and
 - using the at least one reactive species ~~atom-plasma processing~~ for the damage-free shaping of a surface.
4. (Currently amended) A method for shaping elements out of silicon, comprising:
 - creating an annular plasma;
 - injecting a separate flow of a precursor into the annulus center of the annular plasma;
 - exciting the precursor with a radio frequency (RF) power via the annular plasma to create at least one reactive species; and
 - using the at least one reactive species ~~atom-plasma processing~~ for the damage-free shaping of a surface.
5. (Currently amended) A method for shaping silica glass optics, comprising:
 - creating an annular plasma;

injecting a separate flow of a precursor into the annulus center of the annular plasma;
exciting the precursor with a radio frequency (RF) power via the annular plasma to create at least one reactive species; and
using the at least one reactive species ~~atom-plasma-processing~~ for the damage-free shaping of a surface.

6. (Currently amended) A method for shaping aspheric optics, comprising:
creating an annular plasma;
injecting a separate flow of a precursor into the annulus center of the annular plasma;
exciting the precursor with a radio frequency (RF) power via the annular plasma to create at least one reactive species; and
using the at least one reactive species ~~atom-plasma-processing~~ for the damage-free shaping of a surface.
7. (Previously presented) The method of claim 21 operating in a subtractive manner.
8. (Currently amended) A method for shaping surfaces, comprising:
creating an annular plasma;
injecting a separate flow of a precursor into the annulus center of the annular plasma;
exciting the precursor with a radio frequency (RF) power via the annular plasma to create at least one reactive species; and
using the at least one reactive species ~~atom-plasma-processing~~ for the damage-free shaping of a surface; and
operating so as not to leave behind a contaminated redeposition layer.
9. (Previously presented) The method of claim 21 using a plume of the plasma.

10. (Previously presented) The method of claim 21 using a plume of the plasma operating as a sub-aperture tool.
11. (Previously presented) The method of claim 21 wherein a plume of the plasma is translated across a workpiece.
12. (Currently amended) A method for shaping surfaces, comprising:
 - creating an annular plasma;
 - injecting a separate flow of a precursor into the annulus center of the annular plasma;
 - exciting the precursor with a radio frequency (RF) power via the annular plasma to create at least one reactive species; and
 - using the at least one reactive species ~~atom plasma processing~~ for the damage-free shaping of a surface; and
 - monitoring an emission spectrum to determine process rates.
13. (Previously presented) A method for shaping surfaces, comprising:
 - creating an annular plasma;
 - injecting a separate flow of a precursor into the annulus center of the annular plasma to create at least one reactive species;
 - using reactive atom plasma processing for the damage-free shaping of a surface; and
 - using carbon tetrafluoride (CF₄) in argon to create the plasma.
14. (Currently amended) A method for shaping surfaces, comprising:
 - creating an annular plasma;
 - injecting a separate flow of a precursor into the annulus center of the annular plasma;
 - exciting the precursor with a radio frequency (RF) power via the annular plasma to create at least one reactive species; and
 - using the at least one reactive species ~~atom plasma processing~~ for the

damage-free shaping of a surface; and
using C2F6 in argon to create the plasma.

15. (Currently amended) A method for shaping surfaces, comprising:
creating an annular plasma;
injecting a separate flow of a precursor into the annulus center of the
annular plasma;
exciting the precursor with a radio frequency (RF) power via the annular
plasma to create at least one reactive species; and
using the at least one reactive species ~~atom-plasma processing~~ for the
damage-free shaping of a surface; and
using sulfur hexafluoride (SF6) in argon to create the plasma.
16. (Canceled)
17. (Canceled)
18. (Previously presented) The method of claim 21 operating in an additive manner.
19. (Previously presented) The method of claim 21 for removing damage introduced
by previous process steps.
20. (Previously presented) The method of claim 21 for removing surface roughness.
21. (Currently amended) A method for shaping surfaces, comprising:
injecting a separate flow of a precursor into the center of an annular
plasma;
exciting the precursor with a radio frequency (RF) power via the annular
plasma to create at least one reactive species; and
using the at least one reactive species ~~atom-plasma processing~~ to shape
and polish a surface.

22. (Canceled)
23. (Canceled)
24. (Canceled)
25. (Canceled)
26. (Canceled)
27. (Canceled)
28. (Canceled)
29. (Canceled)
30. (Canceled)
31. (Canceled)
32. (Previously presented) The method of claim 21, further comprising:
using the at least one reactive species to react with selected materials
which comprise the surface.
33. (Canceled)
34. (Canceled)
35. (Canceled)
36. (Canceled)

37. (Previously presented) The method of claim 62 including the step of moving at least one of the plasma and the surface relative to the other.
38. (Canceled)
39. (Previously presented) The method of claim 66 including the step of moving at least one of the plasma and the surface relative to the other.
40. (Canceled)
41. (Withdrawn) A method to clean a surface, comprising:
creating a plasma;
using a species which has been selected in order to react with selected materials which comprise the surface and which reactive species does not react with other materials of the surface;
injecting a flow of the species into the center of the plasma to create reactive species; and
using reactive atom plasma processing to selectively clean the surface by allowing the reactive species to react with the selected materials which comprise the surface without reacting with other materials of the surface.
42. (Withdrawn) The method of claim 41 including the step of moving at least one of the plasma and the surface relative to the other.
43. (Canceled)
44. (Previously presented) The method of claim 60 operated at one of above and below atmospheric pressure.
45. (Previously presented) The method of claim 62 operated at one of above and

below atmospheric pressure.

46. (Withdrawn) The method of claim 41 operated at one of the above and below atmospheric pressure.
47. (Previously presented) The method of claim 66 operated at one of above and below atmospheric pressure.
48. (Previously presented) The method of claim 60 operable on a conductive surface.
49. (Previously presented) The method of claim 62 operable on a non-conductive surface.
50. (Withdrawn) The method of claim 41 operable on one of a conductive surface, a non-conductive surface, and a semiconductor surface.
51. (Previously presented) The method of claim 66 operable on a semiconductor surface.
52. (Previously presented) The method of claim 60 wherein the step of using reactive atom plasma processing to selectively shape the surface is a deterministic step which can be selectively in one of an additive mode and a subtractive mode.
53. (Previously presented) The method of claim 62 wherein the step of using reactive atom plasma processing to selectively shape the surface is a deterministic step which can be selectively in one of an additive mode and a subtractive mode.
54. (Withdrawn) The method of claim 41 wherein the step of using reactive atom plasma processing to selectively shape the surface is a deterministic step which can be selectively in one of an additive mode and a subtractive mode.

55. (Previously presented) The method of claim 66 wherein the step of using reactive atom plasma processing to selectively shape the surface is a deterministic step which can be selectively in one of an additive mode and a subtractive mode.
56. (Previously presented) The method of claim 60 operated at about atmospheric pressure and at one of above and below room temperature.
57. (Previously presented) The method of claim 62 operated at about atmospheric pressure and at one of above and below room temperature.
58. (Withdrawn) The method of claim 41 operated at about atmospheric pressure and at one of above and below room temperature.
59. (Previously presented) The method of claim 66 operated at about atmospheric pressure and at one of above and below room temperature.
60. (Currently amended) A method for shaping surfaces, comprising:
creating an annular plasma;
injecting a separate flow of a precursor into the center of the annular plasma;
exciting the precursor with a radio frequency (RF) power via the annular plasma to create at least one reactive species; and
using the at least one reactive species ~~atom plasma processing~~ for the damage-free shaping of a surface to fit a pre-determined contour.
61. (Canceled)
62. (Currently amended) A method for shaping surfaces, comprising:
creating an annular plasma;
injecting a separate flow of a precursor into the center of the annular plasma;

exciting the precursor with a radio frequency (RF) power via the annular plasma to create at least one reactive species; and
shaping a surface deterministically and damage-free with the at least one reactive species to fit a pre-determined contour.

63. (Canceled)

64. (Currently amended) A method for shaping surfaces, comprising:
creating an annular plasma;
injecting a separate flow of a precursor into the center of the annular plasma;
exciting the precursor with a radio frequency (RF) power via the annular plasma to create at least one reactive species; and
using the at least one reactive species ~~atom-plasma processing~~ for the damage-free and deterministic shaping of a surface by at least one of:
selecting a part of the surface to shape;
selecting a material to shape on the surface; and
controlling the removal rate of a material on the surface under shaping.

65. (Canceled)

66. (Currently amended) A method for shaping surfaces, comprising:
creating an annular plasma;
injecting a separate flow of a precursor into the center of the annular plasma;
exciting the precursor with a radio frequency (RF) power via the annular plasma to create at least one reactive species; and
shaping a surface deterministically and damage-free with the at least one reactive species by at least one of:
selecting a part of the surface to shape;

selecting a material to shape on the surface; and
controlling the removal rate of a material on the surface under
shaping.

67. (Canceled)